Questions for the Record

House of Representatives Energy & Commerce Committee, Subcommittee on Innovation, Data, Commerce

Hearing on *Self-Driving Vehicle Legislative Framework: Enhancing Safety, Improving Lives and Mobility, and Beating China*

Gary Shapiro, President and CEO, Consumer Technology Association

The Honorable Jeff Duncan

1. **Mr. Shapiro, consumers in transit deserts often struggle to find affordable mobility solutions to get to mass transit, to work or to their healthcare provider. One solution is to provide autonomous shared use vehicles, such as autonomous shuttles, that can reach consumers where they live with safe and accessible service. What can this Committee do ensure your members providing autonomous shuttles can solve transportation needs for customers in transit deserts?**

Autonomous vehicles (AVs) can play a critical role in complementing public transit, addressing gaps in public transit systems, and providing safe and affordable transportation options in 'transit deserts' with limited public transportation systems.

One key to unlocking AV service in transit deserts is scale, allowing AV developers to build and deploy enough vehicles to provide service to more areas. To accomplish this goal, the Committee should raise the current statutory cap on manufacturing purpose-built self-driving vehicles or SDVs (e.g. those without human operator controls), such as AV shuttles. The current cap was set in 1973 and today represents a U.S.-only barrier to investment, development and the manufacturing of AVs by limiting the number of vehicles that can be built and put into commercial service to just 2500 vehicles per year, for a maximum of two years. The current limitation on scaled manufacturing is a direct hindrance to the expansion of service. Raising it to allow scaled development and deployment would address transportation needs for millions of people, including Americans living in transportation deserts.

In addition, the Committee should support public-private partnerships between public transit and AV providers, creating public buy-in and allowing AV developers to continue to scale and expand their service. As just one example, a 2019-2020 pilot study between Waymo and the Valley Metro Regional Public Transportation Authority for Metro Phoenix showed that AVs helped improve transportation options by providing a safe, accessible, and affordable mobility solution for participants, including seniors and people with disabilities.

The Honorable Janice Schakowsky

1. **Mr. Shapiro, You stated that AVs will start out as expensive but then become more affordable: "It starts out expensive and rapidly goes down with competition." Would you please provide price ranges for expensive and more affordable?**
    - **How long do you predict it will take to go from expensive to "rapidly" going down?**

Decades of technology innovation have demonstrated a common principle: advanced and cutting-edge technology products typically reach the market at high prices, but rapidly decline in price in response to

competition and mass production. As just one example, twenty years ago, a high-end High Definition (HD) TV retailed for over $2000. In 2022, consumers buying new TVs can purchase 4K Ultra-HD smart TVs for just a few hundred dollars – a fraction of the 2002 cost.

The same principle is projected to apply to the SDV industry. Autonomous vehicle companies are making significant investments in the development of lidar and other key AV technologies, which can help reduce costs associated with manufacturing and operation. Currently, AV sensor suites are expensive to produce, and the technology is expensive to develop. As with all technologies, we expect to see these costs start to come down in the coming years. For example, through investments in integrated photonics, Pittsburgh-based Aurora has developed a lidar-on-a-chip solution that will dramatically reduce the cost of FirstLight Lidar, enabling it to scale at large volumes.

Currently, there are no self-driving vehicles available for consumer purchase in the United States, making exact price benchmarking for consumer-owned vehicles a challenge. However, AV as a service (e.g. ride hailing) is currently available and can offer an instructive example. In current ride hail models, price-per-ride is expected to be highly competitive with existing market participants, creating immediate value to underserved communities by helping ensure that the world's most advanced technology is available broadly, regardless of ZIP code or purchasing power. Aggregated research from Ford, the Rocky Mountain Institute, Morgan Stanley, KPMG and other research organizations also suggests that the cost of ownership for autonomous vehicle fleets (i.e. taxis or similar) will decline over the next decade to just a fraction of the cost of human-driven vehicle fleets.

Of course, cost projections depend in part on the U.S. policy environment for AVs. Regulatory support from this Subcommittee and Congress more broadly for a federal framework to support AV development and deployment will contribute to lower costs for businesses and consumers.

2. **You stated that, "On the positive side, especially if you don't have the driver requirement, you take a lot of costs out of the build, out of the vehicle," and "If the insurance companies respond, there will be lower costs for a self driving vehicle."**

    - **Mr. Shapiro, How much money do you predict companies will save?**
        - **Would you please provide original, independent substantiation and citations (not including media reports) for these assertions?**

The steering wheel, steering column, dashboard, driver display, side view and overhead mirrors, gas and brake pedals and other driver-centric features add cost and weight to vehicle manufacturing. These input costs affect manufacturing costs and thus in a competitive market affect the cost to consumers.

In addition, AVs take individuals out of the driver's seat and turn them into passengers, reducing the cost of traveling by reducing stress and freeing the rider to make better use of their time. A study by Securing America's Future Energy (SAFE) calculated that AVs decrease the time cost of driving for errands and shopping by 30 percent. The same study found that AVs allow riders to recoup time during a daily or weekly commute, allowing recapture of up to 32.5 percent of the average hourly wage.

More, the Stevens Institute of Technology projects that as adoption of AVs grows, personal line insurance will fall by 40 percent as auto insurance premiums drop. By 2035, the savings for consumers could be as much as $25 billion, or 12.5 percent of the total market.

The Honorable Russ Fulcher

1. **Increasingly, cars and trucks for that matter are sophisticated computers on wheels. If a vehicle is going to take over key functions of driving, then what happens to the owner's liability in an accident with an AV?**

The current legal system more than adequately addresses any issues posed by autonomous driving. Liability for a crash involving an AV should be determined in accordance with the same applicable principles of law that would govern liability for a crash involving a non-AV – with liability determined on a case-by-case basis to assign fault to the appropriate party or parties based on the unique facts and circumstances of the case.

Current negligence and product liability law outlined in state law, generally, has adapted for many new technologies. We do not create new liability structures for every new technology in the US. Our system of common law will adapt and apply law to new technologies. It's part of what makes the US an innovation hub.

2. **We are moving from Level 3 autonomous vehicles, where the vehicle can perform key functions of the driver, but under certain conditions such as at certain speeds, to Level 5 vehicles where the human has no ability to drive. How should we think about liability when humans can engage versus the vehicle? What about cases where the vehicles is not sure when to engage? As we transition to a fully autonomous vehicle, what are areas around the issue of liability that we need to consider? Can you speak to why regulating level 2 and levels 3-5 together creates consumer confusion about the capabilities of the technology?**

It is critical to distinguish the role of a human in the driver's seat for all levels of driving automation under the SAE International standard to avoid confusion among the public. SAE International developed the "Levels of Driving Automation," a taxonomy for the six levels of driving automation, to clarify the role of a human driver, if any, when the driving automation technology is engaged. This taxonomy has also been endorsed by the U.S. Department of Transportation in its repeated guidance to those testing, developing, and operating an ADS on public roads.

Technologies classified as Levels 1 and 2 (ADAS) are driver support features, such as automatic emergency braking and lane-keeping assistance, that, when engaged, help a human driver perform their driving task. At these levels, the human is still ultimately driving the vehicle and must constantly supervise the support features to maintain safety. Technologies classified as Levels 3-5 are automated driving features that, when engaged, can drive the vehicle without human monitoring required, with Levels 4 and 5 requiring no human driver at any time.

Cases around liability will not be one-size-fits-all equations and must be evaluated on their individual facts, circumstances, and merits just as liability is currently determined today. As outlined above, vehicles capable of level 4 or 5 automation will never require a human being to assume control of the vehicle, and may not have human operator controls such as a steering wheel or brake pedal. However, even in these circumstances, humans (whether passengers, after-market retrofitters, or bystanders intending harm) are capable of any number of actions that would impact the point of liability, such as purposefully disabling or altering the sensor suite as originally designed, assembled and configured. Liability must continue to be determined in accordance with the unique facts and circumstances of the event in question, and existing law has shown itself fully capable of doing so.

3. **As you know, vehicles equipped with advanced driver assistance systems, or ADAS, are currently on the roads and, in fact NHTSA announced an NPRM which would require more of these features to be included in vehicles moving forward and continued advancements of these ADAS features. However, I have concerns that talking about ADAS with AVs can cause some confusion. Even Professor Koopman [Koopman], in his testimony indicates that Level2+ vehicles, which he cites separately is a made-up term, can perform almost all the driving, but goes on to say they are prone to abuse due to automation complacency. I think this is exactly why we need to talk about ADAS and AVs separately so we can squash this confusion around the actual safety benefits and capabilities of AVs, and prevent them from continuing to get blamed for being unsafe due to such misconceptions. I would like to understand the need for manufacturers to develop a cybersecurity plan for the protection of data on vehicles. This is particularly true when it comes to counter hacking over various vehicle control functions. I analogize it to industrial controls on equipment. Can you discuss the role of each bill when it comes to this issue?**

Bills by both Representative Latta and Representative Dingle include consumer education on vehicles, including partial automation capabilities. Many often confuse vehicles with lower levels of autonomy as "autonomous vehicles" when they are really vehicles with driver assist technology (i.e., ADAS).

On cybersecurity, AV legislation could include provisions requiring manufacturers to develop a cybersecurity plan for AVs, and many American AV manufacturers already have cybersecurity provisions in place. Cybersecurity risks are constantly evolving, so continuous improvement in handling them is critical. Any legislation should allow manufacturers and developers the flexibility to respond to risks nimbly and expeditiously.

CTA believes that a cybersecurity plan may: set out the manufacturer's policy for preventing, detecting, and responding to cyber risks, establish a process for identifying, assessing, and mitigating reasonably foreseeable cyber risks; and establish a transparent process for taking preventive and corrective action to mitigate cyber risks.

Rep. Latta's SELF DRIVE Act discussion draft includes a section dedicated to the "Cybersecurity of Automated Driving Systems" to address these matters. The plan outlined in the draft bill aims to ensure that manufacturers are adequately addressing potential vulnerability detection and response practices, identifying the individual responsible for the management of cybersecurity, and creating a process for controlling access to automated driving systems, and appropriately training employees and management who will face potential issues.

4. **With regards to industries like insurance, as automated features take on more of the driving tasks, it is increasingly important for insurers to be able to identify vehicles equipped with advanced technology systems and to be able to fully assess the risk profile of the vehicle to underwrite insurance policies. Liability here connects to underwriter risk. How do things like assessing risk come into play when it comes to these levels of autonomous vehicles? Any suggested areas to obtain more expertise in this issue as we move forward?**

It is important to differentiate between ADAS-equipped vehicles, which continue to be consumer owned and where the individual purchases insurance through a carrier, and ADS-equipped vehicles, such as ride hailing fleets, where the business is responsible for carrying insurance. As both bills address only L4 and L5 vehicles, the question of insurance for personally-owned ADAS equipped vehicles is not immediately in scope.

With respect to ADS-equipped vehicles, to date the only circumstances where this exists is in a fleet-owned model (e.g. ride hailing or delivery) where the company in question owns the vehicles and operates a service. The question of measuring insurance risk is thus one to be directly addressed and determined between the AV operator and the insurance carrier in a business-to-business contract. Currently, the market is working well to provide competitive, appropriately priced insurance options for L4 AV developers and providers. In many cases, American AV developers provide access to data that insurers need to underwrite the risk, place coverage, and carry out policies. When the premiums charged by the insurance marketplace do not properly reflect AV risks' true exposures, AV companies may choose to retain certain risks. As the insurance industry gains more understanding of AV performance through the current market, premiums should naturally converge to the appropriate level for AVs.

The Honorable Kelly Armstrong

1. **Virtual testing is a critical technique used by industry to validate the safety of new vehicle technologies. By using simulation software, manufacturers are able to provide a deeper understanding of system performance and safety – this includes situations that are impossible or dangerous to test in the real world. Do you think the government's safety assurance programs should use software tools with the same level of fidelity and sophistication as industry to rigorously test ADS software before widespread deployment on US roads?**

Virtual testing, or simulation, is an important tool for AV developers and is taking on a growing role in technology development. Virtual testing provides greater test coverage in a scalable, cost-effective, and safe manner. It helps testers identify scenarios that need more and better testing in the real world, enabling more efficient use of limited test track resources. It also enables testing of scenarios that are impossible or dangerous to test in the real world. This reduces the cost of testing, extends testing reach, enhances the efficacy of regulatory evaluation, and serves the public good.

As the technology progresses, it is possible that simulation will become the default testing mechanism, and it is equally likely that the federal government will consider adopting an approach to utilize it in systems evaluation. In principle, the U.S. government's safety assurance programs should use simulation software tools. However, at this stage of the technology's development simulation suites are not single uniform tools, but rather complex, developer-specific, software considered sensitive trade secrets protected by patents. Simply put, different companies use different tools that are specifically calibrated to their systems. They are not interoperable, thus making it impossible to apply a single, uniform testing approach across companies. Given this reality, NHTSA should continue to rely on self-certification and not create additional barriers to deployment or inequitable treatment for autonomous vehicles.

More, testing must be objective, replicable, and judged against a NHTSA standard. At present, NHTSA does not have ADS standards. As such, there is nothing to objectively assess performance against. NHTSA itself has acknowledged that before it can consider promulgating new standards for AVs, it first needs more on-road data from self-driving vehicles. Part of demonstrating credibility is validating the simulation model against real world performance and testing in certain scenarios, which can be done without the government needing to develop software tools as sophisticated as ADS developers'

simulation technology. The only way to generate more on-road data from AVs is by putting more AVs on the road. That is why raising the exemptions cap is so critical and mutually beneficial to both industry and government.

CTA also encourages the U.S. Department of Transportation (USDOT) to continue to engage with industry and learn about industry standards development work with groups like SAE international, the Automated Vehicle Safety Consortium (AVSC), and others. This engagement is particularly critical in light of budgetary and human resource limitations at the agencies to keep up with the pace of industry.

The Honorable Earl L. "Buddy" Carter

1. **When AVs are being tested in communities, what is the process for working with local leadership on integrating these vehicles?**

AV companies should be transparent and open with cities, fostering active communication with government agencies and communities at the national, state, and local level. Across AV developers, companies have shown themselves committed to working with local communities in the cities where they operate, making community and government outreach a core element of deployment efforts. These companies regularly brief state-level agencies regarding activities and planned expansion; participate in stakeholder groups with state and local governments and transportation officials; and work with local law enforcement and first responders on interaction plans to communicate essential information about how AVs are built and operate, as well as potential hazards for first responders.

Engagement also extends to the communities within cities. Engagement with local leaders can range from briefings to demos or exploring partnerships with transit to explore opportunities to reduce transit deserts and provide first-mile/last-mile connections and companies should go where people are to provide information at community events or existing organizations.

2. **I have several ports in my district so I'm well aware of the need for truck drivers to transport goods. Given we currently see a shortage of truck drivers, how can autonomous vehicles improve supply chain efficiency?**

Multiple companies are developing autonomous technology designed for trucks, with the goal of helping to alleviate the truck driver shortage while increasing the safety of American highways. Estimates suggest that the U.S. faces a shortage of over 80,000 drivers. That number is expected to increase by 160,000 by 2030. The trucking industry is increasingly looking to autonomous vehicles to help close that gap and keep the economy moving.

More, autonomous trucks are uniquely suited to longer routes that are more challenging for today's truck drivers. They can make lengthy trips between terminals and across the country without leaving homes or families behind, and they're able to drive for long hours without getting tired or distracted. Autonomous trucks can operate nearly 24/7, only stopping to pick up new loads, refuel, and be inspected and maintained. This will greatly increase supply chain efficiency across the country, expanding the entire freight and logistics ecosystem.

A recent study, funded by the U.S. Department of Transportation, found that the adoption of ADS in the long-haul trucking sector will spur $111 billion in aggregate investment spending across the U.S. economy. The study estimates that autonomous trucks will increase employment across the U.S. economy by 26,400-35,100 jobs, depending on the speed of adoption. While long-haul driving employment does dip slightly, the study estimates that automation will create more demand for truck drivers on the shorter routes many prefer. In addition, given the current shortage of drivers, the expected pace of adoption and

the increasing freight demands, it is also anticipated that there is very low risk to current truck drivers losing their jobs to automation.